SUPPORT FOR THE AMENDMENTS

The amendments to Claims 6 and 22 and newly-added Claims 32-35 are supported by the specification, in particular by paragraph [0018]. Accordingly, no new matter is believed to have been added to the present application by the amendments submitted above.

REMARKS

Claims 6 and 10-35 are now pending. Favorable reconsideration is respectfully requested.

The present invention relates to a high-strength aluminum alloy fin material for heat exchangers having high strength and good in thermal conductivity, erosion resistance, sag resistance, sacrificial anode effect and self-corrosion resistance, comprising:

0.8-1.4 wt% of Si,

0.15-0.7 wt% of Fe,

1.5-3.0 wt% of Mn, and

0.5-2.5 wt% of Zn,

Mg present as an impurity and limited to at most 0.05 wt%; and the remainder comprises impurities and Al;

where the aluminum alloy fin material

has a tensile strength before brazing of at most 240 MPa;

a tensile strength after brazing of 150 MPa or more; and

a recrystallized grain size after brazing of 500 μm or more.

See Claim 1.

The present invention also relates to a high-strength aluminum alloy, operable as a fin material, comprising:

aluminum,

0.8-1.4 wt% of Si,

0.15-0.7 wt% of Fe,

2.2-3.0 wt% of Mn,

0.5-2.5 wt% of Zn, and

less than 0.02 wt% of Mg, present as an impurity;

where said aluminum alloy:

has a tensile strength before brazing of at most 240 MPa;

a tensile strength after brazing of 150 MPa or more; and

a recrystallized grain size after brazing of 500 μm or more.

See Claim 22.

The rejections of the claims under 35 U.S.C. §102(b)/§103(a) over Kuroda are respectfully traversed, since Kuroda is not available as prior art against the present application.

The publication date of Kuroda is June 24, 2004. The present application claims benefit of the filing date under 35 U.S.C. §120 to a Japanese priority application filed on February 3, 2004. Applicants submit herewith a certified English translation of the Japanese priority application.

Since the priority date of the present application, February 3, 2004, is prior to the publication date of Kuroda, that reference is not available as prior art against the present application. Accordingly, the rejection is unsustainable and should be withdrawn.

The rejections of Claims 6, 10-11, 13, 15-21, 27 and 30 under 35 U.S.C. §102(a)/§103(a) over Shoji in view of Sanders and Lyle is respectfully traversed. The cited references fail to disclose or suggest the claimed method.

The Office alleges that Shoji discloses several high-strength aluminum alloy fin materials for heat exchangers having high strength and excelling in thermal conductivity and sacrificial anode effect. For example, the Office cites alloy 6 of Shoji which comprises the following composition: 0.8 wt% of Si, 0.2 wt% of Fe, 1.6 wt% of Mn, 1.5 wt% of Zn, and aluminum and unavoidable impurities as remainders (see Table 1 of the reference). The Office asserts that this embodiment falls within the scope of the claims of the present application.

However, Shoji actually teaches that a high-strength aluminum alloy fin material for heat exchangers which comprising 0.8 mass% of Si, 0.2 mass% of Fe, 1.6 mass% of Mn, 1.5 mass% of Zn, 0.15 mass% of Cu, 0.16 mass% of Zr, and aluminum and unavoidable impurities as remainders. See the description of alloy 6 in Table 1 of the reference. Alloy 6 of Shinji is, in fact, outside the scope of the claims of the present application.

It is apparent for a person of ordinary skill in the art that the alloy taught by Shoji (Shoji, Tables 1 and 3, alloys 1-26) must contain at least one of 0.05-0.3 mass% of Zr and 0.05-0.3 mass% of Cr. See Shoji, abstract, claim 1.

Shoji teaches (paragraph [0017]) that Zr and Cr in a fin material raise the strength of the fin material before soldering and after soldering, and they improve elevated-temperature-proof buckling nature and formability.

Shoji further teaches (paragraph [0017]) that both the desirable content ranges of Zr and Cr are 0.05 %-0.3 mass%, at less than 0.05 mass%, the effect is small. If the amounts of these elements exceed 0.3 mass%, a crystallized material that is big and rough will form at the time of casting. This will injure the strip-processing nature, and it will become difficult to manufacture a plate.

A person of ordinary skill in the art, upon reading Shoji at the time the present invention was made, would have been discouraged from reducing the amount of Zr to less than 0.05 mass% in alloy 6 taught by Shoji in order to prevent the strength of the fin material before soldering and after soldering from decreasing and to prevent elevated-temperature-proof buckling nature and formability from deteriorating.

Shoji teaches (paragraph [0015]) that Cu in a fin material raises the strength of the fin material before soldering and after soldering, and it improves formability.

Shoji further teaches if the desirable content of Cu is 0.06 mass% - the range of 0.2 mass%, the effect is small at less than 0.06 mass% and, if 0.2 mass% is exceeded, the ability of a fin to function as a sacrificial anode will be reduced.

A person of ordinary skill in the art, upon reading Shoji at the time the present invention was made, would have been discouraged from reducing the amount of Cu to less than 0.06 mass% in alloy 6 described by Shoji in order to prevent the strength of the fin material before soldering and after soldering from decreasing and to prevent formability from deteriorating.

The Office also alleges that Shoji does not explicitly disclose that Mg is present as an impurity in the alloy. Both Sanders (Sanders, page 305, "11. Aluminum Alloys") and Lyle (Lyle, page 12, "3.1.1. Impurities in the Molten Metal" and Table 4) disclose that Mg is either inherently present or is expected to be present as a trace impurity in typical aluminum alloys. According to the Office, therefore, Mg is either inherently or expected to be present in the aluminum alloy of Shoji.

Indeed, Sanders discloses (Sanders, page 305, "11. Aluminum Alloys") that the primary aluminum metal also contains small usually not to exceed 0.05% in total, amounts of many other elements and some of these trace impurities are Cu, Mn, Ni, Zn, V, Na, Ti, Mg and Ga, most of which are present in quantities substantially below 100 ppm.

However, Lyle does not disclose (Lyle, page 12, "3.1.1. Impurities in the Molten Metal" and Table 4) that Mg is either inherently present or is expected to be present as a trace impurity in typical aluminum alloys. Rather, the reference actually discloses (Lyle, page 13, 1st column, lines 1-6) that alloying is normally carried out in the temperature range 700-730ºC. and the lower-melting additions, such as Zn, Mg, Cu, and Si, are made in elemental form, whereas the higher-melting point additions are made as master alloys or briquettes (see Table 5).

Furthermore, Shoji teaches (Shoji, paragraph [0019]) that Mg improves the strength as well as the sag resistance at high temperature and the formability of fin materials. Shoji further teaches (Shoji, paragraph [0019]) that the preferable range of Mg is 0.05 mass%-0.2 mass% since the technical effect is small with below 0.05 mass% Mg and brazability deteriorate with a content of Mg above 0.2 mass%.

A person of ordinary skill in the art, upon reading Shoji, Sanders and Lyle, at the time the present invention was made, would have added Mg in elemental form to adjust the Mg content to 0.05 mass%-0.2 mass% in the alloy melt of Shoji as taught by Lyle in order to improve the strength as well as the sag resistance at high temperature and the formability of fin materials as taught by Shoji, since Mg is a trace element which is present in quantity substantially below 100 ppm in primary aluminum metal as taught by Sanders.

For the reasons given above, a person of ordinary skill in the art would not be motivated or taught by Shoji to formulate alloy materials encompassed by the limitations of claim 6 of the present application.

Therefore, Shoji together with Sanders and Lyle does not teach or suggest a high-strength aluminum alloy fin material for heat exchangers having high strength and good in thermal conductivity and sacrificial anode effect comprising 0.8-1.4wt% of Si, 0.15-0.7wt% of Fe, 1.5 -3.0wt% of Mn, and 0.5-2.5wt% of Zn, Mg presents as an impurity and limited to at most 0.05wt%, and the remainder comprising impurities and Al.

Obviousness cannot be sustained by mere conclusive statements of one's own personal understanding or experience, or on the assessment of what would be basic knowledge or common sense. Rather, the Office Action must point out some concrete evidence in the record to support a legal conclusion of obviousness. See MPEP §2144.03.

It is well settled that a reference is said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. See MPEP §2141.02(IV) and §2145(X)(D).

In addition, if the proposed modification would render the prior art invention being modified unsatisfactory or inoperable for its intended purposes, then there is no suggestion or motivation to make the proposed modification. See MPEP §2143.01(V).

The Office alleges that although Shoji does not explicitly disclose the claimed tensile strength before or after brazing or recrystallized grain size after brazing, when the structure recited in the reference is substantially identical to that of the claims, the claimed properties or functions are presumed to be inherent.

Indeed, Shoji actually does not disclose "the structure" of a high-strength aluminum alloy fin material for heat exchangers, fin material 7 (Shoji, Table 2, fin material 7).

Furthermore, when the composition recited in the reference (Shoji, Table 1, alloy 6) is substantially different from that of claim 6 as discussed above, the structure recited in the reference, for fin material 7 (Shoji, Table 2, fin material 7) which is made of alloy 6, will be appreciated to be substantially different from that of the claim 6.

Therefore, it is not appropriate to conclude that claimed properties or functions are inherent.

Obviousness cannot be sustained by mere conclusive statements of one's own personal understanding or experience, or on the assessment of what would be basic knowledge or common sense. Rather, the Office must point out some concrete evidence in the record to support a legal conclusion of obviousness. See MPEP §2144.03.

The Office Action further alleges that where the claimed product and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. See MPEP §2112.01.

However, Shoji fails to suggest the improved combination of a high tensile strength before brazing (at most 240 MPa), a high tensile strength after brazing (150 MPa or more), high erosion resistance and high sag resistance (a recrystallized grain size after brazing of 500μm or more) that is achieved in accordance with the present invention over the ranges of claim 6, which specifies an alloy composition comprising 0.8-1.4 wt% of Si, 0.15-0.7 wt% of Fe, 1.5-3.0 wt% of Mn, and 0.5-2.5 wt% of Zn, Mg presents as an impurity and limited to at most 0.05 wt%, and the remainder comprising impurities and Al.

Thus, in the present application, claimed properties or functions are presumed to be different from those recited in the reference when the ranges of alloy composition recited in the reference is completely different from that of the claims.

In view of the foregoing, the combination of Shoji in view of Sanders and Lyle fails to disclose or suggest the method set forth in Claims 6, 10-11, 13, 15-21, 27 and 30. Accordingly, the subject matter of the those claims is not anticipated by or obvious over those references. Withdrawal of this ground of rejection is respectfully requested.

The rejections of Claims 12, 14, 22-26, 29 and 31 under 35 U.S.C. §103(a) over Shoji in view of Sanders and Lyle is respectfully traversed. The cited references fail to suggest the claimed method.

The Office alleges that Shoji discloses several high-strength aluminum alloy fin materials for heat exchangers having high strength and excelling in thermal conductivity and sacrificial anode effect. The Office cites alloy 14 which has the following composition: 1.0

wt% of Si, 0.6 wt% of Fe, 2.3 wt% of Mn, 1.0 wt% of Zn, and aluminum and unavoidable impurities as remainders (see Table 3 of the reference). The Office has taken the position that this embodiment falls within the scope of the rejected claims of the present application.

However, Shoji actually teaches that a high-strength aluminum alloy for fin material for heat exchangers, e.g., alloy 14, which comprises 1.0 mass% of Si, 0.6 mass% of Fe, 2.3 mass% of Mn, 1.0 mass% of Zn, 0.15 mass% of Cu, 0.20 mass% of Zr, and aluminum and unavoidable impurities as remainders (Shoji, Table 3, alloy 14). This embodiment of Shoji does not fall within the scope of the rejected claims.

It is apparent to a person of ordinary skill in the art that the alloy taught by Shoji (Shoji, Tables 1 and 3, alloys 1-26) must contain at least one of 0.05-0.3 mass% of Zr and 0.05-0.3 mass% of Cr. See the abstract and claim 1.

Shoji describes (see paragraph [0017]) that Zr and Cr in a fin material raise the strength of the fin material before soldering and after soldering, and these elements improve elevated-temperature-proof buckling nature and formability.

Shoji also describes (paragraph [0017]) that both the desirable content ranges of Zr and Cr are 0.05 %-0.3 mass%, at less than 0.05 mass%, the effect is small. If the amounts of these elements exceed 0.3 mass%, a crystallized material that is big and rough will form at the time of casting. This will injure the strip-processing nature, and it will become difficult to manufacture a plate.

A person of ordinary skill in the art, upon reading Shoji at the time the present invention was made, would have been discouraged from reducing the amount of Zr to less than 0.05 mass% in alloy 6 of Shoji in order to prevent the strength of the fin material before soldering and after soldering from decreasing and to prevent elevated-temperature-proof buckling nature and formability from deteriorating.

Shoji teaches (paragraph [0015]) that Cu in a fin material raises the strength of the fin material before soldering and after soldering, and it improves formability.

Shoji further teaches that the desirable content of Cu is from 0.06 mass% to 0.2 mass%. The effect is small at less than 0.06 mass% and above 0.2 mass%, the potential of a fin material to function as the sacrificial anode in a fin will be reduced.

A person of ordinary skill in the art, upon reading Shoji at the time the present invention was made, would have been discouraged from reducing the amount of Cu to less than 0.06 mass% in alloy 6 taught by Shoji in order to prevent the strength of the fin material before soldering and after soldering from decreasing and to prevent formability from deteriorating.

The Office further alleges that although Shoji does not explicitly disclose that Mg is present as an impurity in the alloy, both Sanders (Sanders, page 305, "11. Aluminum Alloys") and Lyle (Lyle, page 12, "3.1.1. Impurities in the Molten Metal" and Table 4) disclose that Mg is either inherently present or is expected to be present as a trace impurity in typical aluminum alloys. According to the Office, therefore, Mg is either inherently or expected to be present in the aluminum alloy of Shoji.

Indeed, Sanders discloses (Sanders, page 305, "11. Aluminum Alloys") that the primary aluminum metal also contains small usually not to exceed 0.05% in total, amounts of many other elements and some of these trace impurities are Cu, Mn, Ni, Zn, V, Na, Ti, Mg and Ga, most of which are present in quantities substantially below 100 ppm.

However, Lyle does not disclose (Lyle, page 12, "3.1.1. Impurities in the Molten Metal" and Table4) that Mg is either inherently present or is expected to be present as a trace impurity in typical aluminum alloys but actually discloses (Lyle, page 13, 1st Column, lines 1-6) that alloying is normally carried out in the temperature range 700-730°C and the lower-melting additions, such as Zn, Mg, Cu, and Si, are made in elemental form, whereas the

higher-melting point additions are made as master alloys or briquettes (see Table 5 of the reference).

Furthermore, Shoji teaches (see paragraph [0019]) that Mg improves the strength as well as the sag resistance at high temperature and the formability of fin materials. Shoji also teaches (see paragraph [0019]) that the preferable range of Mg is 0.05 mass%- 0.2 mass% since the technical effect is small with below 0.05 mass% Mg and brazability deteriorates above 0.2% mass Mg.

A person of ordinary skill in the art, upon reading Shoji, Sanders and Lyle at the time the present invention was made, would have added Mg in elemental form to adjust the Mg content to 0.05 mass% - 0.2 mass% to the alloy melt of Shoji as taught by Lyle in order to improve the strength as well as the sag resistance at high temperature and the formability of fin materials as taught by Shoji, since Mg is a trace element which is present in quantity substantially below 100 ppm in primary aluminum metal as taught by Sanders.

For the reasons given above, a person of ordinary skill in the art would not be motivated or taught by Shoji to formulate alloy materials encompassed by the limitations of the claims of the present application.

Therefore, Shoji together with Sanders and Lyle does not teach or suggest a high-strength aluminum alloy fin material for heat exchangers having high strength and good in thermal conductivity and sacrificial anode effect comprising 0.8-1.4 wt% of Si, 0.15-0.7 wt% of Fe, 1.5 -3.0 wt% of Mn, and 0.5-2.5 wt% of Zn, Mg presents as an impurity and limited to at most 0.05 wt%, and the remainder comprising impurities and Al.

Obviousness cannot be sustained by mere conclusive statements of one's own personal understanding or experience, or on the assessment of what would be basic knowledge or common sense, rather, the Office Action must point out some concrete evidence in the record to support a legal conclusion of obviousness. See MPEP §2144.03.

It is well-settled law that a reference teaches away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. See MPEP §2141.02(IV) and §2145(X)(D).

In addition, if the proposed modification would render the prior art invention being modified unsatisfactory or inoperable for its intended purposes, then there is no suggestion or motivation to make the proposed modification. See MPEP2143.01(V).

The Office Action alleges that although Shoji does not explicitly disclose the instantly claimed tensile strength before or after brazing or recrystallized grain size after brazing, when the structure recited in the reference is substantially identical to that of the claims, the claimed properties or functions are presumed to be inherent.

Indeed, Shoji actually does not disclose "the structure" of a high-strength aluminum alloy fin material for heat exchangers, fin material 16 (Shoji, Table 4, fin material 16) which is supposed to be made of alloy 14.

Furthermore, when the composition recited in the reference (Shoji, Table 3, alloy 14) is substantially different from the claimed invention as discussed above, the structure recited in the reference, for fin material 16 (Shoji, Table 4, fin material 16) which is supposed to be made of alloy 14, is substantially different from the claimed invention.

Therefore, it is not appropriate to conclude that claimed properties or functions are presumed to be inherent.

Obviousness cannot be sustained by mere conclusive statements of one's own personal understanding or experience, or on the assessment of what would be basic knowledge or common sense. Rather, the Office Action must point out some concrete evidence in the record to support a legal conclusion of obviousness. See MPEP §2144.03.

The Office further alleges that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. See MPEP §2112.01.

However, Shoji fails to suggest the improved combination of a high tensile strength before brazing (at most 240 MPa), a high tensile strength after brazing (150 MPa or more), high erosion resistance and high sag resistance (a recrystallized grain size after brazing of 500 μm or more) that is achieved in accordance with the claimed invention.

Thus, in the present application, the claimed properties or functions are different from those recited in the reference when the ranges of alloy composition recited in the reference is completely different from that of the claims.

In view of the foregoing, Shoji in view of Sanders and Lyle fails to disclose or suggest the claimed method. Accordingly, the subject matter of the pending claims is neither anticipated by or obvious over those references. Withdrawal of this ground of rejection is respectfully requested.

The rejection of the claims under 35 U.S.C. §112, second paragraph, is believed to be obviated by the amendment submitted above. The term "excelling" has been removed from the claims.

In view of the foregoing, the claims are definite within the meaning of 35 U.S.C. §112, second paragraph. Withdrawal of this ground of rejection is respectfully requested.

Regarding the Restriction Requirement, Applicants request rejoinder of Claim 28. Claim 28 depends from Claim 22. Since Claim 22 is allowable for the reasons described above, Claim 28 is allowable as well, by virtue of its dependence from Claim 22. Rejoinder is accordingly requested.

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

James J. Kelly, Ph.D.
Attorney of Record
Registration No. 41,504

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/03)